

**The Impact of Climate Change on Nature-Based Tourism on the Alabama Coast:
A Provider Side Perspective**

by

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Climate change, nature-based tourism, coastal tourism, tourism providers, perceptions,
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Abstract

The Alabama Gulf Coast exemplifies the hallmarks of a thriving nature-based tourism destination. However, climate change poses threats to the natural resources and infrastructure that make the destination attractive and accessible to visitors. Tourism providers are important and unique voices in nature-based tourism due to their observation of, and adaptations to, weather and environmental changes. However, few studies have focused on the perception of tourism providers about climate change, compared to those of visitors. To address this void in the literature, I conducted semi-structured interviews with tourism-related stakeholders (n=33) on the Alabama coast. Interviews covered tourism providers' background and experience related to tourism in the region, their observations of environmental changes, their implementation of adaptation strategies, and their perceptions about climate change. Data generated through these conversations were analyzed using inductive reflexive thematic analysis. Participants frequently brought up residential development and in-migration unprompted, leading us to explore these topics as an additional research question following data collection. Findings indicate that most tourism providers in our study had noticed long-term changes in weather patterns and environmental conditions, while a minority failed to notice changes. Tourism providers commonly perceived that the ocean and beaches will retain their attractiveness to tourists in the face of a changing climate but expressed concerns about how their personal livelihoods and well-being would be affected, emphasizing the need to aid individual tourism businesses and organizations with adaptation. Many participants were already implementing practical measures to improve their resilience to weather and environmental impacts but did not necessarily frame these measures as adaptation to climate change. Additionally, some tourism providers expressed

concern about how rapid residential development in Baldwin County, Alabama contributes to increasing vulnerability to climate change and rising costs of living for long-term residents as well as environmental degradation. Based on these results, municipalities on the Alabama coast should consider the use of zoning regulations and protected areas to minimize the unplanned spread of residential development in Baldwin County.

Artificial Intelligence (AI) Use Disclosure Statement

In the preparation of this thesis, the following Artificial Intelligence (AI) tools were used: Otter.ai and ChatGPT. These tools were used primarily to transcribe interview audio files and search for academic sources, respectively. The author acknowledges full responsibility for the intellectual content of this work and has ensured that all AI-assisted sections have been reviewed and revised for accuracy and appropriate academic style. All AI-generated content was reviewed and validated for relevance, appropriateness, and accuracy before incorporation into the final document to maintain scholarly integrity of this research.

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List of Abbreviations

USD	United States Dollar
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
EPA	Environmental Protection Agency
MSA	Metropolitan Statistical Area
IBHS	Institute for Business and Home Safety
FEMA	Federal Emergency Management Agency

Chapter 1: Tourism Provider Perceptions of Climate Change and its Effects on Tourism: A Qualitative Study on the Alabama Coast

Introduction

Nature-based tourism depends on the natural beauty, ideal climates, and outdoor recreational opportunities supplied by resilient ecosystems to attract visitors and provide high-quality experiences (Imbsen et al., 2024). Climate change, defined as long-term changes in average weather patterns (Grade et al., 2023), impacts regional weather patterns and the conditions of ecosystems, which can positively or negatively affect the appeal, quality, and accessibility of nature-based tourism destinations over the short and long-term (Mahon et al., 2021). Coastal tourism is particularly vulnerable to the adverse effects of climate change due to the interacting impacts of sea level rise and hurricanes of increasing intensity (Moreno & Becken, 2009). When destinations become less attractive as environmental conditions shift, tourists can choose to forgo visiting the destination (Gössling et al., 2012), causing economic losses for tourism providers and threatening their livelihoods.

The perceptions of tourists about weather patterns and climate change have been extensively covered in the literature (see review in Wilkins & Horne, 2024), revealing that changing weather patterns can have positive or negative impacts on visitation, depending on the activity type and geographic location (Miller et al., 2022). For example, while increasing temperatures are expected to increase visitation for national parks by extending the shoulder season (Fisichelli et al., 2015), warmer temperatures have been correlated with lower visitation for winter-based destinations due to decreases in the quality and quantity of snow (Chapagain et al., 2018). In contrast, the number of studies describing the perceptions of tourism providers—those creating, managing, and adapting tourism services in response to changes—is far less

(Wilkins & Horne, 2024). Because studies have largely focused on shifting tourism demand and resulting economic consequences for the tourism industry, the impact of climate change on tourism is often conceptualized at the system level, rather than at the level of the lived experience of individual tourism operators. Within the literature on tourism providers and climate change, studies have shown that tourism providers often notice environmental changes due to working near nature (Lamborn & Smith, 2019; Horne et al., 2021) and that they adapt to these changes when necessary to protect the longevity of their operations (Horne et al., 2021; Chen et al., 2022). Tourism providers are often presented as economic actors responding to climate change-driven shifts in tourism demand by implementing adaptation strategies, rather than as individuals whose livelihoods and personal well-being are vulnerable to climate change.

In addition to the need for understanding the perceptions of tourism providers, no study has explored the impacts of climate change on nature-based tourism on the Gulf Coast of Alabama (Wilkins & Horne, 2024). The Alabama coast is composed of only two counties, Baldwin County and Mobile County, making it a small geographically bounded region that lends itself to an in-depth analysis of how tourism providers perceive climate change. The Alabama coast has a thriving nature-based tourism industry (Alabama Tourism Department, 2023), and, as a coastal destination, is particularly vulnerable to the impacts of climate change (Biasutti et al., 2012). Our study fills these gaps by using semi-structured interviews to address the following questions:

- (1) How do tourism providers perceive weather and environmental changes on the Alabama coast?
- (2) How do tourism providers perceive the present and future impacts of weather and climate change on tourism on the Alabama coast?

Climate Change and Nature-Based Tourism in Alabama

Located on the northern Gulf of Mexico, Alabama has 53 miles of true coastline and over 600 additional miles of tidal shoreline that make up Mobile Bay, a large inlet and estuary, and other bays, rivers, and bayous (see Figure 1.1; United States Census Bureau, 2010). Visitors are drawn to the coastline for its natural beauty and the opportunity to participate in a variety of coastal tourism activities, including fishing, beach-going, hiking, boating, and birding (Gulf Shores & Orange Beach Tourism, n.d.). Further inland, while generally less of a draw than Alabama's beaches, Mobile Bay and the Mobile-Tensaw Delta are nationally recognized biodiversity hotspots (Duncan & Wilson, 2013) that provide ample opportunities to engage in nature-based tourism recreation.

The Gulf Coast region of Alabama supports a vibrant nature-based tourism industry that, in 2023, generated almost \$3.5 billion (USD) in travel-related earnings and accounted for 41.3% of the state's tourism economy (Alabama Tourism Department, 2023). Baldwin County contains the popular beach destinations of Gulf Shores and Orange Beach and the Gulf State Park, while Mobile County contains the major municipality of Mobile and the barrier island of Dauphin Island. Tourism and recreation make up 91.8% and 17.7% of the total ocean economies in Baldwin and Mobile counties, respectively (National Oceanic and Atmospheric Administration [NOAA], 2024). Earnings related to travel have increased for most years in both counties, although to a much greater extent in Baldwin County (Alabama Tourism Department, 2023).

Whereas the tourism of Alabama's coastal counties drives the economy and employment of the area, the Alabama Gulf Coast region is also vulnerable to climate change impacts. Between the years 2021 and 2025, the Mobile Area (Baldwin, Mobile, and surrounding counties in southwest Alabama, Mississippi, and Florida) experienced the warmest average consecutive

five-year interval since 1900 (see Figure 1.2; National Weather Service [NWS], n.d.). Extreme precipitation events are predicted to become increasingly more intense (United States Environmental Protection Agency [EPA], 2016b) and more frequent (Runkle et al., 2022) in Alabama, especially for areas near the Gulf Coast (Biasutti et al., 2012). At the same time, droughts may become more intense in Alabama due to higher temperatures increasing the rate of evaporation of water from the soil and longer periods between rain events (Biasutti et al., 2012; EPA, 2016b; Runkle et al., 2022). The frequency of severe tropical storms, the rate at which they intensify, and the amount of precipitation associated with them is predicted to increase in the Gulf of Mexico due to warming sea surface temperatures (Knutson et al., 2010; Garner, 2023). From 1993–2020, the Eastern Gulf of Mexico has experienced a rate of sea level rise of 5.6 millimeters per year, greater than the global mean sea level change of 3.3 millimeters per year (NOAA, n.d.).

The impacts of climate change pose opportunities and threats for the nature-based tourism industry on the Gulf Coast of Alabama (see Table 1.1). Coastal destinations that are relatively hotter in the baseline may experience decreases in tourism in summer months when temperatures are especially high, but increases in tourism in the shoulder months, which will begin to have more favorable conditions (Amelung & Viner, 2006). Storms of higher intensity may require areas to stay closed longer to repair the damage caused by high winds, storm surges, and flooding. Waves and storm surges from hurricanes, in conjunction with sea level rise, contribute to beach erosion (Stockdon et al., 2012). Beaches of reduced width provide less space for recreational activities and are less aesthetically pleasing (Uyarra et al., 2005; Atzori et al., 2018). Sea level rise will cause beaches and other intertidal habitats such as saltwater marshes to migrate landward with the movement of the low-water mark (Pontee, 2013). However, in some

areas, the landward translation of these habitats will be blocked by human-made structures, narrowing the habitat and causing habitat loss in a process known as “coastal squeeze” (Scott et al., 2012b; Pontee, 2013).

Table 1.1

Opportunities and Threats to the Nature-Based Tourism Industry on the Alabama Coast Posed by Climate Change Impacts

Climate change impact	Opportunities (+) or threats (-) to nature-based tourism	Citations
Warming temperatures	Lower participation in outdoor activities on high heat days (-); Safety risk (-)	Atzori et al., 2018; Basu, 2009
	More favorable conditions during shoulder seasons (+)	Amelung & Viner, 2006
Changes in precipitation	Higher participation in outdoor activities on dry days (+)	Mahon et al., 2021
	Lower participation in outdoor activities during heavy rain (-)	Marvasti, 2013; Mahon et al., 2021
	Damage to tourism infrastructure from inundation (-)	Mahon et al., 2021
	Reduced water availability for the tourism sector (-)	Cashman et al., 2012
Increasing hurricane intensity	Beach erosion (-)	Uyarra et al., 2005 ; Atzori et al., 2018;
	Damage to infrastructure from storm surge, high winds, and inundation (-); Safety risk (-)	Woosnam & Kim, 2013
Sea level rise	Beach erosion (-)	Vousdoukas et al., 2020
	Loss of biodiversity from “coastal squeeze” (-)	Pontee, 2013; Scott et al., 2012b
	Damage to infrastructure from inundation (-)	Scott et al., 2012b
	Reduced water availability for the tourism sector (-)	Cashman et al., 2012

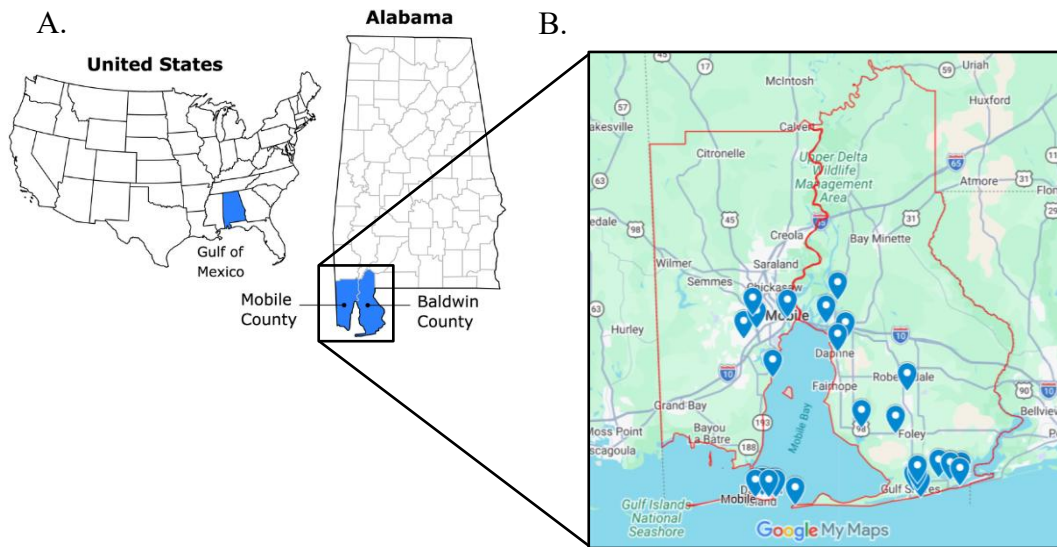
Methodology

Data Gathering

The purpose of this study was to understand how tourism providers in the Alabama Gulf Coast region are conceptualizing environmental changes and to explore whether tourism professionals are connecting these changes to the sustainability of the region's tourism economy. To meet the objectives of this study, I conducted semi-structured interviews with nature-based tourism-related personnel in Baldwin and Mobile counties, Alabama (see Figure 1.1). A list of contacts was created using individuals within the research team's current network and by consulting tourism marketing websites (e.g., <https://www.gulfshores.com>) to identify tourism-related organizations within the study area. The contact list was further expanded by searching the internet for specific organization types using keywords such as "boat charters in Gulf Shores, Alabama." Recruitment was focused on the following types of organizations: (1) local tourism-related businesses, such as guides and accommodations; (2) land management agencies; (3) government offices, (4) conservation and education-related organizations; and (5) destination marketing and tourism departments. Conducting in-depth interviews with participants from diverse types of organizations within the tourism industry and across geographic areas within the coastal region provided us with the opportunity to form a nuanced understanding of how experiences with climate change vary across and within groups and geographic areas (Creswell, 2014).

Figure 1.1

Map of Study Area



Note. Interviewees were recruited from Baldwin and Mobile counties, the coastal counties of Alabama. Panel A adapted from “Dominant attitudes and values toward wildlife and the environment in Coastal Alabama,” by Hertel et al., 2023, *Conservation Science and Practice*, 5(8), e12957 (<https://doi.org/10.1111/csp2.12957>). CC BY 4.0. Pins in Panel B mark the approximate location of participants’ places of work. Panel B created using Google My Maps (Google, 2026). Map data ©2026 Google, INEGI.

To provide information about the study and inquire about their interest participating, I reached out to individuals or organizations on the contact list via phone call or email, depending on the method that seemed to elicit the best response rate from each organization type. Follow-up attempts were gradually made if participants did not respond to the first email or answer the first phone call. An Excel spreadsheet was used to track each contact with potential participants and to later determine response rate for the study. During the interview phase, additional contacts

were added to the spreadsheet using snowball sampling by asking participants at the end of interviews if they had recommendations for future participants (Noy, 2008).

A semi-structured interview instrument was used to guide conversations. This instrument, along with all other research protocols, was reviewed and approved by the research team's Institutional Review Board. The questions in the interview guide were open-ended, allowing participants to naturally narrate their stories and bring up ideas that they felt were relevant. For this study, participants were asked questions and clarifying sub-questions about: (1) participants' background and experience related to tourism in the region; (2) personal observations of environmental changes; and (3) how, if at all, these changes impacted tourism in the region.

Most interviews were conducted in person at an individual's place of work or a public meeting spot, while a minority were conducted over the phone due to scheduling conflicts or strong participant preference. With the permission of participants, interviews were audio recorded, and participants were asked to repeat the verbal consent agreement on the audio recording as a form of documentation. The interviewer took notes during the interview session to document relevant observations, such as non-verbal communication, and in case recording equipment failed, although this did not occur (Creswell, 2014). Additional field notes, or memos, were written at the end of each interview day to document observations that were not recorded during the interviews, to make preliminary interpretations of the interviews, and to reflect on the methodological process and any necessary revisions (Groenewald, 2004). Adequate documentation and reflection during the data gathering process allowed researchers to pinpoint when and how themes were constructed and to begin the data analysis process in an iterative manner. Field notes also enhance the validity of the study by serving as a secondary form of data that contributes to the study findings (Creswell, 2014).

Recruitment and interviews continued in this manner until a sufficient degree of data saturation was met (Low, 2019). Qualitative studies have commonly defined saturation as the point at which the data become redundant and cease to provide new information (Low, 2019). However, Low (2019) disagrees with this definition because a point at which no new information emerges can never truly be reached, and focusing solely on the emergence of consistent themes excludes unique ideas that are also relevant. There are multiple ways to define and assess saturation in qualitative research and being transparent about the procedure used can improve validity (Morse et al., 2014). For the purposes of this study, we conceptualized data saturation as the point at which the collection of additional data did not meaningfully affect preliminary interpretations of the data, while acknowledging that there is no fixed end point to analysis. Towards the end of data collection, ideas brought up by participants during the interviews and their recommendations for future participants became more consistent, a process that was documented using memos and discussed amongst the research team as an indication that a sufficient depth of data saturation had been reached. At the end of data collection, all participants on the contact list had been contacted at least once. The data gathering period spanned from May through August of 2025.

Data Analysis

The interview audio recordings were transcribed verbatim using the transcription software Otter.ai, followed by researchers listening through the transcriptions and correcting errors. The transcribed interviews were uploaded into the qualitative data management software NVivo (version 15.3) to create a database. Guided by the research questions, data analysis was performed using an inductive reflexive thematic approach as described by Braun and Clarke (2006). The coding process was non-linear and recursive as suggested by Bryne (2022), with

researchers repeatedly moving back and forth between the development of fine-scale codes and broader themes to deepen engagement with the dataset. Multiple researchers independently coded the data, allowing the research team to discuss different interpretations and refine themes, while acknowledging the possibility of multiple logical ways to structure coding based on the constructivist epistemological underpinnings of thematic analysis (Bryne, 2022).

Results

Interviews were conducted with 33 tourism professionals currently working in the study area. One hundred three individuals were invited to participate via phone call, email, or in-person contact, yielding a 32% response rate based on the researchers' list of potential contacts. Of those identified who did not participate, nine (8.7%) declined due to time conflicts, feeling as though they were not an adequate fit for the study, or lack of interest. Ten (9.7%) initially expressed interest but did not respond to follow-up attempts, while the remaining 51 (49.5%) never responded to our invitations. Of the 33 interviews conducted, participants represented tourism-related businesses (n = 14), land management agencies (n = 7), government offices (n = 2), conservation and education-related organizations (n = 7), and destination marketing departments (n = 3). The length of full-time residency of participants in the study area ranged from 4 to 69 years, with an average of 24 years. Interviews lasted, on average, 43 minutes (range 13 – 88 minutes).

Observations of Weather and Environmental Changes

During interviews, I asked participants if they had noticed any weather or environmental changes during their time working in the tourism industry on the Alabama coast. Many reported that they had noticed some type of weather and environmental changes, while a sizable number of providers reported that they had not observed weather or environmental changes in the region

(i.e., coded “no changes”). For those that reported observations of environmental changes, a variety of changes were described (see Table 1.2).

Table 1.2

Weather and Environmental Changes Observed by Participants

Higher-Level Themes	Lower-Level Codes
Changes in hurricane and storm intensity, frequency, and behavior	More frequent hurricanes and storms
	More intense hurricanes and storms
	Hurricanes intensifying rapidly
	Storms less predictable
Warmer temperatures	Warmer air temperatures
	Warmer water temperatures in the Gulf
	Warmer sand temperatures
Changes in species’ abundance	Decrease in vulnerable species
	Increases in warm-adapted species
	Other
Seasonal disruption and phenological changes	Longer summers
	Insect season lasts longer
	Longer hurricane season
	Phenological mismatch
	Gulf stays warm longer
More frequent weather extremes	More temperature extremes
	More drought and heavy rainfall
Changes related to sea level rise	Beach and shoreline erosion
	More frequent and severe flooding
	Sea level rise in general
	Marshes migrating inland
Decreases in water quality	Decreases in water clarity
	Increase in severity and frequency of algal blooms
Uncertainty	Uncertainty in observations of change
No changes	No change in general
	No change in hurricane intensity, frequency, or behavior
	No warmer temperatures
	No phenological change
	No sea level rise

Changes in Storm Intensity, Frequency, and Behavior. Many tourism providers relayed how, from their personal experiences, the number of named storms in the Gulf of Mexico was rising each year; for example:

Back in the day when I was growing up, [...] there was only maybe six or eight storms the whole season, and then not all of them were hurricanes. And so now you're getting 18, 20, 30 storms a season, so the numbers have gone up dramatically in the amount of storms that are created, whether it's tropical storms or hurricanes.

Several emphasized that, over their time living in the area, they had noticed the strength of thunderstorms or “*non-tropical storms*” increasing, such as a tourism provider who said: “*It just seems that things are much worse, like a thunderstorm used to just be a thunderstorm. A thunderstorm now produces 75 mile per hour straight line winds, and more people are struck by lightning.*” Other participants had also observed an increase in the number of severe hurricanes forming in the Gulf of Mexico, but away from the Alabama Coast. A tourism provider noted how an increase in the number of people living in the area and the conversion of forests for human development in the region could also be a contributing factor to an increase in the damage caused by hurricanes and thunderstorms.

Another trend in hurricanes expressed by providers was the rapid intensification of hurricanes. For example, Hurricane Sally in 2020 shifted course and rapidly intensified directly before making landfall, and some residents and business owners had not made the necessary precautions to protect property from this intensified threat. Some tourism providers emphasized that Hurricane Sally’s behavior was unusual compared to previous hurricanes they had endured, illustrating a perceived trend in unpredictable hurricane behavior.

Warmer Temperatures. Many participants described with confidence noticeable upward trends in air temperatures, particularly in the summer months; for example: “*It's definitely gotten hotter. Yeah, it's, it's pretty brutal. Last August was actually really bad.*” Several participants started their account with a qualifier acknowledging their own biases, such as “*maybe it's*

because I'm getting older...," then described how they perceived temperatures as becoming warmer. A multitude of tourism providers brought up that the Gulf of Mexico (water) becomes warmer than it used to in the summer, while one provider mentioned that sand temperatures on Alabama's beaches have risen over time, a trend they had noticed through direct data collection as part of their job responsibilities.

Changes in Species' Abundance. When describing changes in the sighting of species over time, tourism providers frequently mentioned increased sightings of species typically found at more southern latitudes. For example:

I didn't even hear [about] the first manatee being in Orange Beach, Alabama until about 2019. They've always been a little further south into Florida because the water's warmer down there. That tells me maybe our water is getting a little warmer.

Other species that providers were sighting more frequently and associated with warmer conditions included black bellied whistling ducks, snook, pompano, jellyfish, sharks, and invasive species, such as lionfish. Participants also described a decrease in the abundance of vulnerable species, including nesting shorebirds, sea turtles, butterflies, and dogwood trees.

Seasonal Disruption and Phenological Changes. Some participants detailed extended periods of warm air temperatures in the summer: *"It seems like the heat lasts longer. Starts earlier, lasts longer."* Some participants spoke of the hurricane season lasting longer, the Gulf of Mexico staying warm longer, and insect season lasting longer. A singular participant expounded on the phenological mismatch they had observed between the arrival of cedar waxwings and the fruiting of mulberry trees.

More Frequent Weather Extremes. Many tourism providers mentioned a record-breaking snowstorm that affected the Alabama coast in January of 2025 (a few months prior to

interviews). For example, a tourism provider said: *“We had snow in January, so for us to have eight inches of snow is absolutely insane. I think the last time that happened was like, in the [19]70s. So, like, that was very strange.”* Some participants spoke about the contrast between hot and cold temperature extremes as a change in weather, while others saw it as a *“fluke”* or rare natural occurrence. Another example of more frequent weather extremes described by participants was more frequent drought and heavy rainfall.

Changes Related to Sea Level Rise. Participants spoke on the noticeable effects of beach and shoreline erosion, especially on the exposed barrier island of Dauphin Island, where, according to one provider: *“there's probably at least 50 or 60 parcels that are either fully or mostly underwater on the West End.”* Participants emphasized that the shifting shoals, sandbars, and islands are a result of not only climate change-related drivers, but also the dredging of the Mobile Bay ship channel because the sand that naturally replenishes Dauphin Island following the erosion from hurricanes is removed from the system during dredging. One provider on Mobile Bay visually pointed out how much erosion had occurred on their property during their interview.

Many participants across the study area noted experiencing an increase in *“sunny day”* or *“nuisance”* flooding. Although sea level rise was brought up several times as a long-term contributor to more intense and frequent flooding, the most highly emphasized cause was an increase in human development and, consequently, hardened or impervious surfaces that contribute to flooding.

Decreases in Water Quality. Multiple participants mentioned that the Mobile Bay is becoming less clear; for example, one provider said: *“the Bay's never been clear the 10 years I've been down here, but it's muddier and muddier all the time.”* According to participants, the

cause of this phenomenon is the dredging of the Mobile Bay ship channel. One tourism provider described a decrease in the clarity of the Bon Secour River, which they attributed to human land conversion for subdivisions, while another had observed an increase in the frequency and severity of algal blooms and an associated decrease in water visibility in the Gulf of Mexico.

Uncertainty in Observed Changes. One tourism provider chose not to answer the question regarding if they had noticed weather or environmental changes, citing their human perspective as too biased: *“I would say that that's really hard to capture from perception. I am a science-minded person, so I am not going to kind of come down and make firm assertions about that, right?”*

No Changes. Some participants spoke generally about how they had not witnessed any notable changes. A small subset of this group attributed their lack of observations to having resided in the area for a short period of time.

When asked if they had noticed any changes in the frequency or intensity of hurricanes, a participant replied in a way that was indicative of other providers who did not perceive changes:

No, I really haven't. I just think it's so random, really. I don't think there's anything significant about the strength or how it's going to develop. I think it just, there again, just Mother Nature, just kind of how it goes.

Some participants further elaborated on the human biases that make it difficult to detect long-term weather changes, with a tourism provider saying:

I mean, that's not a very long window of observation, and, you know, if you experience Frederic [1979], then, yeah, that was the worst storm ever. You experienced Ivan [2004], that was the worst storm ever.

Present and Future Impacts of Weather and Climate Change on Tourism

Beyond perceptions of change, I also asked participants prompting questions about the impact of weather events on tourism, the impact of observed weather and environmental changes on tourism, and the potential future impacts of climate change on tourism in the region. I did not define the term “climate change,” but instead allowed participants to interpret it through their own lens. Some participants spoke about the *current impacts of weather* on tourism that they had observed. Others discussed what they perceived as *current impacts of climate change* on tourism. Most respondents talked about *future impacts of climate change* on tourism in the region (see Table 1.3), although some participants perceived that climate change will never have noticeable impacts on tourism.

Warm and Warming Temperatures. Tourism providers mentioned that the warm-weather season for beach and ocean tourism already has or in the future may expand, benefiting the tourism industry. A tourism provider illustrated this by noting: “*From a personal standpoint, I’m almost, as you know, the water warms up, it increases my season. I’ve almost got a doggy fight where I’d be pulling for climate change to extend my season.*” Another tourism provider mentioned how the warming water temperatures in the Gulf of Mexico have increased the resident snook population, providing the opportunity to fish a new species.

Table 1.3

Observed and Predicted Impacts of Weather and Climate Change on Tourism

Weather/Climate Impact		Opportunities and Threats to Tourism	W	CC	O	P
Warm and Warming Temperatures	Positive	More favorable conditions year-round				
		Opportunity to fish new species				
	Neutral	Prevailing appeal of beach and ocean				
		Tourists affected by similar changes at home				
	Negative	Inland tourism is less favorable in summer				
		More pests and marine hazard species				
		Fish less active, kills, or northward migration				
Conditions are less comfortable for providers						
Safety risk to tourists						
Precipitation and Changes in Precipitation	Neutral	Prevailing appeal of beach and ocean				
	Negative	Tourists may cancel due to rain in forecast				
		Planning trips is hard due to unpredictability				
		More unpredictable weather is less appealing				
Drought could impact water supply						
Hurricanes and Increasing Hurricane Intensity, Frequency, and Rapid Intensification	Positive	Increase in tourism when nearby area affected				
		Hurricanes as tourism publicity				
	Neutral	Prevailing appeal of beach and ocean				
		Major hurricanes have hit after peak tourism				
	Negative	Decreased visitation during/after tropical storm				
		More damage from frequent and intense storms				
		Increased risk for vulnerable businesses				
More losses from storms earlier in the season						
Less time to prepare if storms rapidly intensify						
Flooding, Erosion, and other Changes related to Sea Level Rise	Neutral	Tourists often do not notice flooding				
	Negative	Smaller/manmade beaches less attractive				
		Impact of frequent flooding for tourists on DI				
		Inundation of tourism infrastructure on DI				
		Loss of marshes will harm seafood industry				
Threat to groundwater supply on DI						

Note. The following categories were developed during coding to further explore participants’

responses: W = Weather; CC = Climate change; O = Current Observations; P = Future

Predictions

DI = Dauphin Island

Tourism providers frequently stated that the beach and ocean will retain their appeal to tourists despite extreme temperatures. When asked if they thought warming air temperatures would negatively affect beach visitation, a tourism provider in Baldwin County replied: *“I can't imagine. I mean, I can't believe the temperatures and times they come out here. I think they have decided they're going on vacation, and it doesn't matter.”* Others pointed out that tourists come to the beach seeking warm temperatures and that there are ways for beachgoers to cool off and adapt to stifling conditions. Furthermore, the destination is inherently attractive due to the human desire to be near the ocean. A small number of participants spoke about how they did not think shifting seasons or warmer air temperatures would have much of an effect on tourism because tourists are facing similar changes at home, and sometimes to an even greater extent.

However, the idea of the beach and ocean retaining their appeal to tourists did not apply to the impacts of warming temperatures further inland. Tourism providers working in inland areas and whose operations rely on non-beach tourism activities described how the shoulder seasons are when peak tourism is occurring in the region. While summer months still have some visitation, it is less frequent because of the heat, humidity, and bugs, which are unappealing to tourists, especially during the hottest times of the day.

Another negative impact described by several providers was that the temperatures may become unbearably hot for tourism providers. When asked what concerned them about climate change, a tourism provider responded: *“Definitely the habitability of these hot days, and just like being able to actually live in a place where, like, the heat index is 130, and how does that affect your ability to run eco-tourism, outdoor activities, et cetera?”* Another provider shared their intention to relocate in the future, citing hotter and more humid summers as one of the reasons.

Precipitation and Changes in Precipitation. Several tourism providers noted that tourists often inquire about canceling their trips when there is rain in the forecast, despite rain showers being commonplace on the coast and passing through quickly. Multiple tourism providers who run boat charters described the difficulty they experience when planning boat trips due to the unpredictability of storms on the coast. Some tourism providers expressed concern over the unpredictability of storms deterring tourists, who after having one or several trips impacted by bad weather will choose to visit a different, more reliable destination.

Hurricanes and Increasing Hurricane Intensity, Frequency, and Rapid Intensification. Tourism providers mentioned several positive impacts of hurricanes on the tourism industry on the Alabama coast, including an increase in tourism when a nearby destination is affected by a hurricane: *“So, when Hurricane Michael [2018] hit the Florida Panhandle, all of those, a lot of those tours shifted here, so you had a sudden influx of tourists when you wouldn’t usually have them.”* Tourism providers also observed an increase in tourism in the years following hurricanes that affected the Alabama coastline due to news coverage of the event. Some tourism providers felt the beach would continue to be an attractive destination regardless of the future impacts of hurricanes because businesses will *“build back and tourists come down here because we have the beach.”*

Several participants indicated that tourists often cancel their trip when a tropical storm or hurricane is predicted to occur, and that visitation remains decreased following the hurricane due to a lack of operational tourism services. The amount of time for businesses to become operational again following past hurricanes varied. For example, in the case of Hurricane Sally in 2020, a couple of providers’ organizations never closed, some organizations opened within a few days to several weeks, and others (small businesses located directly on the coast) remained

closed for years. A tourism provider said: *“I feel bad for like, people that are, you know, startup businesses, or, you know, businesses that are right on the beach that are totally dependent on that.”* Even after reopening, many tourism providers described lingering effects from the storm as completely removing debris and making repairs takes time.

Some providers described how tropical storm Zeta [2020], which occurred several weeks after Hurricane Sally, resulted in more severe damage due to the consecutive nature of the storms. Similarly, some tourism providers were alarmed about the impact more frequent hurricanes could have on the tourism industry in the future *“because of the amount of moisture and what the infrastructure [there] can handle.”* Many providers were highly concerned about what more intense hurricanes driven by climate change could mean for the tourism industry due to the level of damage and amount of time required to rebuild and reopen following major hurricane events.

Multiple participants noted that hurricanes have tended to hit the Alabama coast at the end of the summer, allowing time to rebuild in the winter and resulting in comparatively less revenue losses than an earlier hurricane would. Some providers were worried that if a hurricane were to hit earlier in the summer season due to climate change, it would cause immense losses for tourism businesses, who heavily depend on summer revenue to make it through the year. One provider expressed concern that, if a hurricane rapidly intensifies directly before making landfall, there may not be adequate time to evacuate the large number of residents and tourists, noting the potential conflict between prioritizing human safety and potential negative economic consequences of mandatory evacuations.

Flooding, Erosion, and Other Changes Related to Sea Level Rise. When asked if the increase in the severity and frequency of flooding had impacted tourism, some providers reported

that tourists seem unaware of the changes as they are not directly affected by them. This trend did not hold true for respondents on Dauphin Island, however. The West End of Dauphin Island is narrow and experiences flooding often, even on sunny days. A provider described how this may be perceived as an inconvenience by tourists staying in the area:

You know, when you go to a rental house and you unpack all your stuff, and then, you know, an hour later, if somebody's calling you saying, 'Hey, we're going to have a high tide and the winds this direction. We really need to move your car down here,' which is five miles from their house. So now they're in a house with no vehicle.

Looking towards the future, one provider on Dauphin Island was worried about the potential for sea level rise to inundate infrastructure, homes, and buildings. Other providers mentioned that tourists may view increasingly narrow or manmade beaches because of erosion unfavorably.

Discussion

The purpose of this study was to better understand climate change perceptions of tourism providers, specifically those involved with nature-based tourism on the Gulf Coast of Alabama. These insights are important in complementing other information sources, such as scientific reports, to understand how environmental impacts influence tourism, a key economic driver and cultural component of coastal Alabama. Our study sought to answer two research questions: (1) How do tourism providers perceive weather and environmental changes on the Alabama coast? (2) How do tourism providers perceive the impacts of weather and climate on tourism?

Observed Weather and Environmental Changes

Of the tourism providers who described weather and environmental changes, many of the observations coincided with scientific evidence. For example, although the frequency of

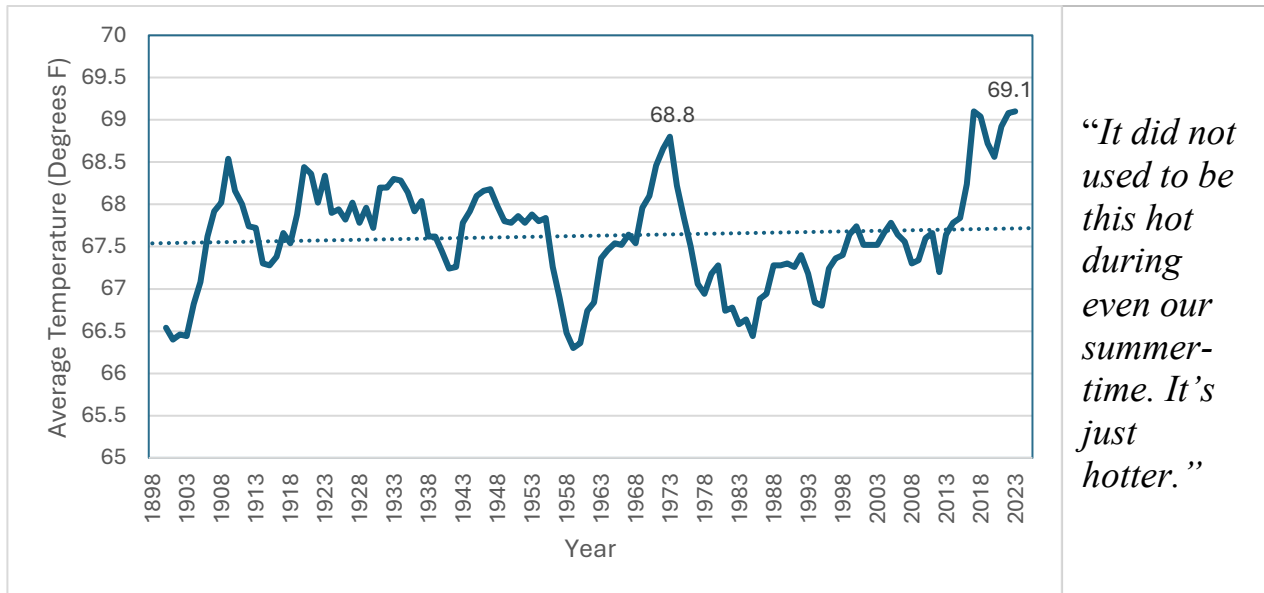
hurricanes worldwide is expected to decrease in the coming years, Lopez et al. (2024) found that the number of tropical storms in the North Atlantic Basin increased from 1970 to 2023 due to an increase in interannual variability. The frequency of severe tropical storms and the amount of precipitation these storms produce has increased worldwide (Xi et al., 2023; Knutson et al., 2010), and rapid intensification of hurricanes has become more likely due to warming sea surface temperatures (Garner, 2023).

Some participants talked about how air temperatures and water temperatures in the Gulf of Mexico have become warmer over their time living in the region. Although, on average, air temperatures have only slightly increased since 1900, a visible upward trend exists in temperatures in the region since around 1980, which is mirrored by many participants' sentiments (see Figure 1.2). Wang et al. (2023) found that, between 1970 and 2020, sea surface temperatures in the Gulf of Mexico have increased by 1.8 degrees Fahrenheit, which is approximately double the global rate of increase.

Increases in the abundance of certain species in the region due to warming air and water temperatures, as mentioned by participants, are also largely supported by scientific literature. For example, manatees have become increasingly prevalent in the northern Gulf of Mexico due to range shifts as water temperatures increase (Cloyed et al., 2021). Likewise, there has been a northward expansion of the range of common snook, a tropical species (Purtlebaugh et al., 2020). Use of e-bird citizen science data has revealed that sightings of black bellied whistling ducks have increased considerably from 2006 to 2016 across the southeastern United States likely due to warming temperatures (Cohen et al., 2019).

Figure 1.2

Centered Moving Average Air Temperatures (5-Year Intervals) in the Mobile Area, 1900–2023



Note. The visible upward trend in average air temperatures in the Mobile Area over the past several decades generally aligns with providers’ perceptions that temperatures are increasing (see example quotation). Temperature data sourced from NWS (n.d.).

Research supports some perceptions of seasonal disruption. For example, Keim et al. (2024) found a statistically significant increase in the length of hurricane season between the years of 1971 and 2022 in the north Atlantic that was characterized by storms earlier in the season. Various studies in the United States (Allstadt et al., 2015; Monahan et al., 2016) have found that the average arrival of spring is earlier as evidenced by sooner flowering and leaf out of vegetation. However, research on local changes in the length of the warm season in Alabama shows that the growing season, defined as the period between the last and first frost, has become slightly shorter (EPA, 2016a)

Although it is difficult to link a specific extreme weather event (i.e., the 2025 Gulf Coast blizzard, which was discussed by many participants) to climate change, mechanisms by which

climate change could potentially contribute to more frequent cold extremes in the United States have been hypothesized. Cohen et al. (2021) drew a link between the climate change-driven accelerated warming in the Arctic and the more frequent weakening and stretching of the polar vortex in recent years, which causes an increase in extreme winter weather in the United States. Participant observations of rainfall events becoming more extreme are also supported, with the number of extreme precipitation events (1 inch or greater) increasing by 53% in the last 20 years in the southeastern United States (Rahman et al., 2023).

The shoreline erosion and deposition occurring on Dauphin Island, and described by study participants, is well documented (Douglass, 1994). Coastal shorelines naturally recede and expand because of wave action, storms, and littoral drift. Climate change increases the rate of sandy beach erosion because waves and storm surges from hurricanes of increasing intensity and sea level rise accelerate the process (Stockdon et al., 2012; Vousdoukas et al., 2020). As described by participants, the dredging of the Mobile Ship Channel has also affected the process of shoreline erosion on Dauphin Island. Between 1974 and 1989, there was an annual removal rate of 450,000 cubic meters of sand per year from the Mobile Ship Channel, and the sand was deposited offshore, outside of the littoral system, where it was unable to naturally replenish Alabama's beaches (Douglass, 1994).

The method for disposing of dredge material from the Mobile Ship Channel has since been modified. A portion of sediment is taken to sites outside of the Bay, some of the sand is used for habitat restoration projects, and the remainder is spread across designated sections of Mobile Bay in thin layers of no greater than 12 inches, a technique known as thin layer placement (Byrnes et al., 2010; Murray, 2024). However, some participants within our study mentioned that, because of thin layer placement, Mobile Bay has become muddier and less clear

over time. Local officials, fisherman, and environmental groups are against the practice due to the potential harm that consistently turbid conditions and large amounts of silt pose to oyster reefs, sea grasses, and other aquatic life in Mobile Bay (Elliott, 2025), a perspective that is supported by available scientific knowledge (Wilber & Clarke, 2001). Proponents of the method with the U.S. Army Corps of Engineers cite the environmental benefits resulting from keeping sediments within the Mobile Bay system, unlike other sediment disposal methods.

Rising sea levels have contributed to an increase in the frequency of nuisance flooding events in coastal areas across the United States (Moftakhari et al., 2015). As described by participants, research supports the concept that increased human development makes coastal areas more vulnerable to the impacts of climate change because impervious surfaces increase the severity of flooding, especially if the development is less concentrated (Brody et al., 2012). Moreover, when wetlands, forests, and other natural areas are altered to accommodate expansion of the built environment, the community loses natural buffers to the impacts of climate change (Brody et al., 2008).

Consulting a combination of human lived experience data and scientific data, it is evident that weather patterns and environmental conditions are shifting on the Alabama coast concomitantly with global changes in the climate. From the dredging and deposition of sediment from the Mobile Bay Ship Channel to the contribution of human development to flooding and storm risk, participants often mentioned that environmental changes are driven by human activities, in addition to climate change. Managing the underlying human causes of environmental changes can be used to lessen the impacts experienced by residents, even in the face of a global phenomenon like climate change that will continue to amplify these processes.

The Impact of Weather and Climate Change on Tourism

Our second research question sought to understand how tourism providers perceive the current and future impacts of weather and climate on tourism on the Alabama coast. Analysis of the interview data revealed that tourism providers perceived positive, neutral, and negative impacts of weather and climate change on tourism that varied geographically. While tourism providers in this study saw the larger tourism system in the region as resilient to the impacts of climate change, they were concerned about how the livability of the destination and their personal well-being would be impacted.

Scott et al. (2012a) emphasize the importance of viewing tourism as a broader system because the negative impacts of climate change on one element of the system or destination may pose an opportunity for other destinations. This viewpoint aligns with the experience of several tourism providers within this study, who said that, when a hurricane hits a nearby destination, it causes an influx of tourists to the Alabama coast. Tourists choosing to visit an alternative, nearby destination in response to their intended destination being less desirable is a form of recreation substitution, in which tourists have been known to substitute the timing, location, or activity in which they choose to participate (Brunson & Shelby, 1993).

Some of the impacts of weather and climate on tourism outlined by participants varied by locality as described in previous research (Wilkins & Horne, 2024). On the Alabama coast, although visitation takes place year-round, visitation rates are the highest during summer months. Further inland, however, tourism providers described how peak visitation rates occur during the fall and spring or winter seasons because the hot and humid weather conditions during summer months are unfavorable for the non-water-based types of recreation that are common in the region, such as hiking and camping. Due to these regional differences, inland areas are more

vulnerable to decreases in tourism in the summer as temperatures warm, although this impact will be buffered by peak tourism occurring in the shoulder seasons. Another vulnerable part of the study area was Dauphin Island, a barrier island with a maximum width of just under a mile. Tourism providers described the most pressing impacts of climate change on tourism in this region, such as the sunny day flooding that regularly occurs on the island.

Waves and storm surges from hurricanes of increasing intensity and sea level rise contribute to beach erosion (Stockdon et al., 2012), and beaches of reduced width are less attractive to visitors (Uyarra et al., 2005; Atzori et al., 2018). Some tourism providers, both in Mobile County, mentioned that smaller beaches are less appealing to tourists or that manmade beaches may lose their attractiveness over time. Nevertheless, the erosion of sanding beaches did not emerge as a dominant concern for tourism providers on the Alabama coast. This discrepancy could be because the width of most of Alabama's beaches have been extended by beach nourishment projects, counteracting negative visitor perceptions. In parallel, in their study on a Florida coastal destination, Atzori et al. (2018) found that, initially, visitors claimed they would be unwilling to visit the destination if the effects of climate change led to the disappearance of beaches. However, most participants said they would continue to visit the same destination in a scenario in which adaptation measures were implemented.

Most tourism providers felt that Alabama's beaches would continue to sustain visitor flows despite warming temperatures and changes in hurricanes, citing the innate appeal of the ocean and beaches, their previous experience with tourists visiting the beaches during extreme heat and following hurricane recovery, and how tourists come to the beach seeking out warm temperatures. While warmer temperatures have been shown to increase participation in coastal tourism (Marvasti, 2013), there are thresholds at which visitors consider the temperature to be

uncomfortably hot for a given activity. For example, Atzori et al. (2018) found that visitors to a Florida coastal destination considered 98°F unacceptably hot for beach visitation. A couple of providers on the Alabama coast were concerned that if hurricanes become more frequent or storms become more unpredictable, it may motivate tourists to choose a less risky destination, which aligns with the results from a tourist choice experiment (Forster et al., 2012) illustrating that tourists avoid destinations where hurricane risks are greater.

Some impacts of climate change and weather on visitor demand were perceived as positive by participants. For example, tourism providers described how, not only did the major hurricanes that affected the Alabama coast fail to deter tourists in the long-term, but the news publicity produced about these natural disasters raised awareness about the existence and attractiveness of the Alabama coastline, contributing to a subsequent increase in tourism. Warming temperatures were described as having positive impacts on visitor demand because they extend the warm season for beach and ocean tourism. Similarly, using a Tourism Climatic index, Amelung and Viner (2006) found that the Mediterranean is likely to become a more favorable destination in the shoulder months due to warming temperatures.

While most tourism providers are confident that the Alabama coast will continue to draw visitors, tourism providers were worried about how climate change will affect the livability of the destination for themselves and the longevity of their business or organization, irrespective of visitation rates. Mirroring the impacts of climate change on the emotional and financial well-being of tourism providers described by Hamouche et al. (2025), some tourism providers were concerned that warming temperatures and increased flooding will make it less comfortable to live in the area. While tourists visit the area for a short time, tourism providers are dealing with the impacts of climate change year-round. This finding underscores the importance of framing

tourism providers as experiencing climate change not solely through its impacts on tourism demand, but also through its impacts on local livability and livelihood stability.

Another key finding was that participants reported concern that consecutive and more intense hurricanes would cause greater damage and require businesses to remain closed longer to make repairs. This finding is consistent with quantitative research on other recreation areas in the Southeast United States (Woosnam & Kim, 2013). Hurricanes can be particularly detrimental for small businesses located on the coast, who may remain closed for extended periods of time or indefinitely (Huang & Medeiros, 2020). Tourism providers were also concerned about the potential for hurricanes to occur earlier in the season and to rapidly intensify, causing more economic losses by interrupting peak tourism season and leaving less time to prepare and evacuate (Garner, 2023), respectively.

Limitations

Information about the potential impacts of climate change on tourism was acquired from tourism providers, with tourism providers giving their perspectives on the behavior and preferences of tourists. In some ways, this approach is advantageous because tourism providers watch how tourism rates and tourist behaviors change in response to differing weather and environmental conditions. However, this approach has its limitations because tourism providers' understanding of tourists' experiences may not align with the actual behaviors or perceptions of a nuanced and diverse tourist population. In addition, the past responses of tourists to weather and environmental change are unlikely to equate to future behavior under heightened impacts of climate change. Conducting future research on the perception of tourists in this region about climate change could help address this limitation. The results from this study are mainly

applicable to the Alabama coast, although some degree of transferability may be possible for similar coastal destinations, particularly along the Gulf coast.

Conclusion

While many tourism providers on the Alabama coast have noticed weather and environmental changes over their time living in the region, others have not. Of the participants who described changes, most of their observations are supported by scientific evidence, corroborating tourism providers' experiences and supplementing existing scientific knowledge. Additionally, many participants were concerned about the human activities that contribute to environmental changes as well as the role of climate change in exacerbating these changes. Regional differences exist in the impacts of climate change on tourism on the Alabama coast, and adaptation strategies should reflect this variation. Tourism providers largely foresee tourism demand to the ocean and beach as resilient to the impacts of climate change but are worried about how they will cope with the changing climate as it may limit their ability to provide quality services or put them out of business for extended periods of time. Future policies should prioritize helping individual businesses to implement adaptation strategies against hurricanes to protect their livelihoods. Tourists may continue to come, but if vulnerable tourism providers are forced out, climate change could cause a restructuring of the tourism system and alter the identity that makes the destination appealing.

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Chapter 2: Climate Change Resilience Within a High-Growth Coastal Region: Perspectives from Tourism Providers on the Alabama Coast

Introduction

Climate change can affect nature-based tourism directly, through changes in broad regional weather patterns (e.g., temperature and precipitation) and the frequency and intensity of extreme weather events, and indirectly, through changes in environmental conditions, such as sea level rise and shifting species ranges (Miller et al., 2022). These impacts are likely to pose opportunities and threats for the nature-based tourism industry by altering the behavior of tourists—who may perceive the changes as more or less appealing—and making areas periodically unsafe or inaccessible (Wilkins & Horne, 2024). Coastal tourism is particularly vulnerable to the adverse effects of climate change because sea level rise and hurricanes of increasing intensity compound to increase infrastructural damage and the rate of sandy beach erosion (Seekamp et al., 2019). Nevertheless, with appropriate planning, tourism providers can take steps to prepare and adapt to these changing conditions, thus offsetting negative perceptions or experiences of visitors and preventing economic losses (Miller et al., 2022).

Simultaneously, tourism destinations that are rich in natural amenities often become desirable places for people to relocate full-time. The population of coastal regions in the United States increased by approximately 40.5 million from 1970 through 2020, resulting in a segment that makes up 40% of the country's total population (NOAA, n.d.). Incoming migration can contribute to rising property values and property taxes through the process of gentrification (Barton, 2014). The influx of residents also results in land cover change and increased impervious surfaces through the construction of roads, residential areas, and other development to support these growing populations. This increase in development can be detrimental to the

resiliency of coastal communities to climate change as resilience is intricately tied to what extent the land is utilized for human development and whether intact coastal ecosystems, such as wetlands, can mitigate the effects of storms (Brody et al., 2007). Rising costs associated with growing populations may decrease the adaptive capacity of tourism providers, as financial constraints are a well-documented barrier to the implementation of adaptation strategies (Matasci et al., 2014; Torabi et al., 2024). Few studies have considered how tourism providers are adapting to weather and environmental changes alongside their perceptions of population growth and human development, representing an important knowledge gap. The Alabama coast, which is composed of only two counties (Mobile County and Baldwin County), was selected as the study area because its limited geographic scope presents a manageable regional context for exploring the phenomenon. Moreover, the Daphne-Fairhope-Foley Metropolitan Statistical Area (MSA) in Baldwin County, Alabama was the sixth fastest growing MSA in the United States based on population growth from 2023-2024 (Baldwin Alliance, n.d.). Our study fills a gap in the current literature by seeking to address the following questions:

- (1) What adaptation strategies are tourism providers on the Alabama coast using to address weather and environmental impacts?
- (2) How do tourism providers perceive human development and in-migration in Baldwin County, Alabama?

Literature Review

Tourism providers can implement multiple adaptations to the impacts of climate change through behavioral-based changes, such as moving events indoors when weather conditions are unfavorable (O'Toole et al., 2019), and structural-based changes, such as elevating buildings in coastal areas to protect structures from storm surges (Becken, 2005), among others. These

measures allow tourism providers to positively influence visitor perceptions and improve the quality and safety of services provided to visitors (Wilkins & Horne, 2024), minimizing economic losses. Atzori et al. (2018) found that most visitors to a coastal destination in Florida would be willing to continue visiting the destination if adaptation measures were implemented despite climate impacts such as eroded beaches or an increase in tropical diseases.

While adaptation measures are being employed by nature-based tourism providers, most measures are reactive rather than proactive. In several studies on snow-based tourism, most, if not all, tourism providers were employing adaptation strategies, with snowmaking and the diversification of offerings being most common (Horne et al., 2021; Wilkins et al., 2021). These tourism providers were reacting to the direct effects of a changing climate on their business operations such as shorter seasons and unpredictable conditions that confound trip planning. In two studies on wildlife tourism, providers had not detected any impacts of climate change on their respective businesses (Saarinen et al., 2012; Pandey & Rogerson, 2023). They did not plan to employ adaptation strategies until they perceived the impacts as serious, even if they acknowledged tourism in the area was likely to be vulnerable in the future. Business owners may take this “wait and see” approach to adaptation due to the lack of adequate knowledge about the local impacts of climate change (Berkhout et al., 2006; Pandey & Rogerson, 2023), making a proactive response impractical (Saarinen et al., 2012). Additionally, in concordance with theories of risk perception (Swim et al., 2009), businesses may choose to focus financial resources on immediate threats to their business, such as issues related to marketing, rather than investing in adaptation for an abstract, future threat with uncertain paybacks (Pandey & Rogerson, 2023).

Multiple studies have presented frameworks for understanding the variation in adaptation strategies from “incremental” responses to short-term weather and environmental impacts to

“fundamental” strategies in preparation for the long-term impacts of climate change (Magnan et al., 2020; Metzinger et al., 2025). In the case of coastal adaptation, hard structural adaptation strategies, such as elevating buildings and constructing sea walls, are relatively short-term solutions (Magnan et al., 2020). Managed retreat, in which waterfront property is abandoned and potentially removed, is a long-term solution (Dedekorkut-Howes, 2020). The length of the effectiveness of nature-based solutions varies based on the adaptive pathway. Beach nourishment, which involves pumping sand from nearshore areas onto beaches, has a short lifespan (Griggs, 2024), while restored coastal habitats may maintain themselves for extended periods and can adapt to sea level rise by migrating landward if their movement is not blocked by human-made structures (Pontee, 2013).

In addition to the longevity of adaptation strategies, many studies have contended with the cost, effectiveness, and socio-cultural and environmental impacts of the different types of coastal adaptation strategies (Dedekorkut-Howes, 2020). In addition to improving the appeal of beaches to visitors, beach nourishment has been found to reduce erosion of barrier islands (Passeri et al., 2021) and damage to infrastructure behind beaches (Griffith et al., 2015) in future storm events. However, beach nourishment is costly, meaning the ability for smaller communities to employ this adaptive measure may be limited by financial resources (Scott et al., 2012). While retreating from the coastline is favorable in theory (Gould and Lewis, 2021), the social, emotional, and financial ramifications of this course of action should not be understated. Retreat is a controversial strategy that is likely to receive little support from residents and local municipalities in areas where the demand for coastal real estate is high (Dedekorkut-Howes, 2020) and coastal tourism provides economic benefits. A more palatable alternative is to structurally reinforce or elevate existing infrastructure and build new infrastructure that is better

suites to withstand the impacts of hurricanes and sea level rise (Dedekorkut-Howes, 2020). However, private structural adaptation has the potential to exacerbate social inequalities because not everyone will be able to afford the solution (Castro, 2024).

Methodology

The initial purpose of this study was to understand how tourism providers on the Alabama coast are adapting to environmental impacts. However, a recurring theme in our interviews with participants was their concern about how human development was impacting coastal conditions and tourism operators' adaptive capacity. Therefore, the purpose of the study was expanded to understand tourism providers' perceptions of how human development changes, in addition to changes in environmental conditions, may impact current and future tourism management.

Data Gathering

Semi-structured interviews with nature-based tourism providers residing in Baldwin and Mobile counties, Alabama were used to investigate our research questions. Nature-based tourism providers included those employed by government offices; land management agencies; conservation and education-related organizations; tourism-related businesses, such as guides and lodging; and tourism marketing offices. By interviewing individuals from a diverse range of businesses and organizations that offer tourism services on the Alabama coast, I was able to construct a comprehensive, yet nuanced view of how the industry is adapting to weather and environmental impacts (Creswell, 2014).

A contact list of potential participants was compiled by consulting tourism marketing websites (e.g., <https://www.gulfshores.com>) and using exploratory internet searches to identify tourism-related organizations on the Alabama coast. Using recruitment materials that were

approved by the Auburn University Institutional Review Board, I reached out to potential participants by phone call or email to provide information about the study and to ask about their interest in participating. A cash or gift card incentive was offered to tourism providers for their time and effort if they chose to participate, although some participants chose not to accept the incentive or were unable to accept it based on employer policies. Follow-up attempts were progressively made if I was unable to reach the individual, and a detailed record of contact attempts and participants' responses was kept to later calculate the response rate. At the end of each interview, I asked participants if they had recommendations for additional participants, following a snowball sampling technique to expand the contact list (Noy, 2008).

Interviews were typically conducted in-person at the participant's place of work or a public meeting space. A small number of interviews were conducted via phone call due to scheduling conflicts or participant preference. All interviews were audio recorded with the permission of participants and transcribed verbatim using a combination of the transcription software, Otter.ai, and the research team, who revised errors. I took memos shortly after each interview as a secondary form of data gathering. Memos were used to document relevant observations during the interviews and to facilitate preliminary data analysis and reflection on the methodology (Groenewald, 2004). Memos allowed me to make minor adjustments to the interview guide or interview techniques as necessary and to begin data analysis while data gathering was ongoing.

A semi-structured interview guide with open-ended questions was used to guide conversations while allowing interviewees to elaborate on their experiences in their own words. Most of the data used to answer the first research question was produced from a section of the interview guide that asked questions concerning tourism provider's implementation of, and

experience with, adaptation strategies to weather and environmental impacts. Because I did not plan to explore the second research question, data was acquired from multiple sections of the interview guide to answer that research question. Probing questions, some included in the original interview guide and others developed ad-hoc, were used to further explore tourism provider's experiences.

Qualitative studies have commonly determined when to cease data collection based on when theoretical saturation is reached, or no new information arises. However, for this study, I adopted the approach that theoretical saturation, which originated from grounded theory, is inconsistent with the theoretical foundations of reflexive thematic analysis because analysis of the dataset is subjective and new information can be produced by interpreting the existing dataset through a new lens (Braun & Clarke, 2022). I chose to end data collection when researchers agreed that the data quality was sufficient to meaningfully address the research questions and when preliminary interpretations of the data were not affected considerably by the collection of new data. In addition, towards the end of data gathering, participants often suggested I interview individuals who had already been interviewed, indicating to the research team that those most central to the research purpose had been included in the sample.

Data Analysis

The interview transcripts were uploaded into the qualitative data management software NVivo (version 15.3). Using the reflexive thematic approach outlined by Braun and Clarke (2006), I inductively coded the interviews line-by-line guided by the original research question (Q1, which pertains to implementation of adaptation strategies). After completing the initial analysis, through repeated engagement with the audio recordings and transcripts, it became apparent that human development and in-migration were also prominent topics discussed by

participants that potentially impact tourism on the coast. Consistent with the flexible and recursive nature of reflexive thematic analysis (Byrne, 2022), I refined the research design to include an additional question, Q2, to more deeply explore tourism providers' perceptions of human development. After the first iteration of coding, the lower-level codes were grouped into higher-level codes based on the structuring of the data that appeared natural to the research team. After independently coding the data, multiple researchers discussed their coding choices to better understand possible interpretations of the dataset.

Data Rigor & Trustworthiness

The memos written after each interview were used as a supplementary form of data, revealing when dominant themes were constructed and supporting the validity of the themes developed by the research team. After listening to the audio files, researchers read the interviews multiple times to deepen engagement. To refine themes and their ability to capture the experiences of participants, the data analysis process was conducted inductively and involved moving iteratively between higher-level themes and lower-level codes. Example quotes are included in the results to illustrate how themes were derived from the narratives of participants.

Results

I interviewed 33 tourism providers residing in the Alabama coastal counties of Baldwin (n = 21) and Mobile (n = 12). The length of residency of participants in the region was between 4 and 69 years (average: 24). Interviewees were employed by government offices (n = 2); land management agencies (n = 7); conservation and education-related organizations (n = 7); tourism-related businesses (n = 14); and tourism marketing offices (n = 3). Out of the 103 individuals I identified as potential participants and invited to participate, 33 (32%) agreed to participate, 10 (9.7%) initially showed interest but did not respond to follow-up attempts, 9 (8.7%) declined,

and 51 (49.5%) never responded. Those that declined to participate cited not having enough time or feeling as though they are not a good fit for the study, often providing the contact information for other potential participants. The length of interviews ranged from 13 to 88 minutes (average: 43 minutes).

Implementation of Adaptation Strategies

During interviews, I asked interviewees if they or their business or organization had taken steps to adapt to, or better prepare for, weather and environmental impacts, such as hurricanes. Most interviewees had adapted in some way. The vast majority were either personally involved in the implementation of an adaptation strategy or were familiar with ways that others in the community were adapting, while some participants were not at all familiar with adaptation strategies. The adaptation strategies described by tourism providers were organized under four themes: structural, nature-based, behavioral, and institutional.

It is important to note that several participants emphasized that the adaptation strategies being implemented in the community are not outwardly presented as addressing the impacts of climate change. According to a tourism provider:

People that have worked for the city a long time understand and do what we can to mitigate and prevent the problem and prepare for the worst. So, without even acknowledging it exists, these political people look good because we're prepared for maybe worse natural disasters, even though they don't attribute it to anything like climate change.

Participants spoke about adaptation strategies implemented at work as well as those that they had implemented personally, such as to their home, which for some was an extension of their business.

Structural Adaptation Strategies. Many participants had personally participated in or were familiar with the Institute for Business and Home Safety's (IBHS) Fortified Home program, which offers standards and guidance on structural mitigation against wind damage. A tourism provider noted that their business' hotel was the first building to receive the Fortified commercial certification under IBHS. Without referring to Fortified standards, other tourism providers described how their buildings or houses have wind resistant windows, permanent hurricane shutters, or are built with strong construction.

Several tourism providers detailed their personal experiences with the effectiveness of Fortified residential and commercial buildings when it comes to minimizing wind damage from hurricanes. According to a provider, a hotel with the Fortified commercial certification had minimal damage after Hurricane Sally [2021] compared to another nearby hotel whose *“roof liner came off, water running down the walls, like the whole place had to be gutted and redone.”* Another provider had witnessed a stark contrast in the conditions of houses that did and did not have Fortified construction in the aftermath of Sally: *“You could drive through neighborhoods, and you would see homes that didn't have a Fortified roof had blue tarps on them. If they didn't have blue tarps, it was because they had a Fortified roof.”* In addition, individuals meeting Fortified standards were also eligible for reduced insurance rates.

Some structural adaptation measures described by participants were focused on minimizing the impacts of storm surge and flooding, such as elevating houses, an adaptation strategy that is especially prevalent on the West End of Dauphin Island. A couple of providers had built buildings farther from the shoreline in response to the worsening effects of flooding. A tourism provider described the effectiveness of *“hurricane pilings”* at protecting their boat during Hurricane Ivan. The boat was attached to tall pilings using ropes that ran through PVC

pipes, keeping the stern stable and allowing the boat to roll up and down the pilings as the water level changed.

A tourism provider said that their business installed pervious surfaces in their parking lot to reduce the impact of flooding:

So, we use a product called True grid, which is made out of recycled plastic jugs. And so there's a round grid system. And so within that grid system, there's layer of sand and a layer of gravel. And so it's allowing our storm water to kind of naturally drain back into the ground.

Additional adaptation strategies intended to reduce flooding risks were expanded drainage culverts and high-pitched roofs on buildings.

Although structural adaptation strategies were mostly perceived as positive, a tourism provider residing in Baldwin County expressed frustration that making structural changes to one's house allows people to use wealth to evade responsibly for continued development in a flood prone area. From the provider's perspective, rapid development has led to an increase in the intensity of flooding due to an increase in impervious surfaces. This tourism provider felt adaptation efforts should be focused on sustainable development in the area, rather than simply “[building] so your house can withstand greater storms.”

Tourism providers frequently mentioned financial barriers to implementing desired structural adaptation strategies. A provider noted the socioeconomic divide between those able to repair their homes and invest in structural adaptation measures versus people who are unable to undertake such measures. The tourism provider states:

I know that, you know, typically, the person who has the home that needs the most repair or most renovating are the people that are least likely to have the money to do it, and

that's, you know, kind of the neighborhood I'm in. You've seen a lot of homes that still look a little tattered after Sally, even though we're five years later.

Some tourism providers had implemented structural adaptation measures to improve visitor safety and comfort when recreating in hot air temperatures. One tourism provider had set up cooling stations, which they described as “*these big, you know, machines that are full of water to blow cold air,*” to help cool visitors down when walking outside. Another tourism provider had incorporated external wooden screens onto floor to ceiling windows on two buildings to increase shade for visitors and improve energy efficiency. One tourism provider explained why their buildings were designed with breezeways:

A breezeway or a dog trot creates a cooling effect because it funnels air, channels air, and it makes it go quicker. And so, you'll notice these, like breezeways, are like, 10 degrees cooler than the outside ambient air [and] ultra, ultra energy efficient.

A tourism provider said that they had deposited “*concrete and debris*” onto their shoreline to make a trash revetment to counteract shoreline erosion. Other homeowners on Mobile Bay use bulkheads or living shorelines for the same purpose, although bulkheads were described as having adverse effects. According to a participant: “*My neighbor has a bulkhead. Well, that makes my property erode terribly, because the waves hit that, and then they come right here and just swirl it all up.*”

A tourism provider detailed that an adaptation strategy being employed by the coastal cities is the addition of bridges and expansion of highways to allow people to evacuate faster in the case of a major hurricane. Other adaptation strategies described by participants were geared toward storing and reusing water. For example, a tourism provider said:

We actually collect that condensation [from the HVAC system], store it, filter it, and then use that to top off the pool. So that saves us an average of 14,000 gallons of water every month, just in pool water that we're not having to pay the city for.

Nature-Based Solutions. A nature-based solution frequently brought up by tourism providers was beach nourishment. Tourism providers explained that beach nourishment projects have been successfully completed in Gulf Shores and Orange Beach and the East End of Dauphin Island, with plans for a beach nourishment effort on the West End of Dauphin Island soon. According to tourism providers, the beach nourishment projects are advantageous because they offer storm protection to the buildings and infrastructure behind the beaches as well as more space for tourists to recreate and for sea turtles to nest.

Some tourism providers explained that a challenge involved with the implementation of beach nourishment projects is sourcing sand that is the correct shape, size, and make up. Some tourism providers emphasized that beach nourishment is highly expensive, while a couple of providers had received negative feedback from tourists who were unaware that stretches of the beach would be temporarily closed for implementation of the strategy. To counteract negative perceptions, effort was spent on educating the public about the importance of beach nourishment.

Dune restoration and the planting of dune vegetation were talked about by multiple tourism providers. Dune restoration serves multiple purposes as illustrated by a tourism provider who said: *“We’ve learned how important the dunes are, not just for storm surge protection, but the valuable habitat they provide for our nesting sea turtles and shorebirds and the Alabama beach mice.”* Another tourism provider explained how, in the Gulf Shores and Orange Beach area, dune restoration has occurred regularly since the 1980s. However, the method of dune restoration has changed to use Christmas trees to provide structure, rather than sand fence, which

leaves metal on the beach. There have also been dune restoration efforts on Dauphin Island, with a volunteer program helping to replant sea oats and other native vegetation to stabilize the dunes and reduce erosion.

Several tourism providers described how, on Dauphin Island, a shoreline restoration project was currently taking place (during data gathering interviews, June to August of 2025). Before reaching the bridge to Dauphin Island, the road juts out into the ocean on a narrow strip of land, making it particularly vulnerable to storms. A few participants explained that, as part of the restoration project, rock breakwaters were placed on either side of the road and that soil collected from the dredging of Mobile Bay is being used to fill the spaces between the road and the breakwaters.

Other adaptation strategies involved protecting land from human development. A tourism provider talked about how the town of Dauphin Island had received a grant from the EPA to buy wetland parcels and set them aside for conservation purposes, although they will serve several functions: *“Maybe it helps improve flood mitigation, but it also enhances habitat. It does a lot of different things. You get more bang for your buck.”* Several tourism providers noted some of the ways the cities of Gulf Shores and Orange Beach have protected natural areas from development, such as through the Bon Secour National Wildlife Refuge and the Gulf State Park. Other benefits of keeping natural areas intact along the coast described by providers include that they offer protection from storms, a natural cooling effect, and keep mosquito numbers low.

In contrast to the large-scale public projects described above, other nature-based solutions were implemented on smaller scales by individual tourism providers. For example, a tourism provider chose which species of trees to replant after a hurricane based on survival rates from the previous storm, with *“cypress trees and live oaks [doing] extremely well in the hurricanes.”* A

tourism provider's business manages stormwater naturally by utilizing underground pipes to transport stormwater into a restored wetland. Another provider was involved in using fire as a management tool to help wetlands recede landward as sea levels rise. The tourism provider explained that, although marsh plants will not be able to continue migrating upslope if they reach human infrastructure, *“fire does open up and get rid of that ecotone and the kind of shaded mid story plants that allow marsh to thrive and move in response.”* A couple of tourism providers were installing bird houses or planting vegetation that act as a *“natural pesticide”* to reduce mosquito numbers.

Behavioral Adaptation Strategies. Many behavioral adaptation strategies brought up by tourism providers were geared towards reducing the risks posed to tourists and tourism providers by hot air temperatures. A tourism provider mentioned that he often reminds tourists about the importance of drinking water on hot days. Tourism providers are also taking precautions to protect themselves when working outside in extreme heat, such as drinking enough water, working in teams for safety reasons, and planning more active work tasks so they are completed during cooler times of the day. However, a formal heat safety plan was not mentioned by any provider.

A tourism provider had chosen to live in a lower risk part of Dauphin Island after seeing the destruction caused by hurricanes on the West End first-hand. Another tourism provider has a secondary form of employment that provides a backup source of income in the case of bad weather or extreme weather events. According to the provider:

And then I have two businesses, so I do clock repair. Still, I don't have a shop anymore, but so that helps me, if it's bad weather wise, and I can sit around and work on clocks.

That really helps me not being so worried about, you know, the tourism thing going away for a few months. I can survive that.

Another tourism provider is self-insured, setting aside money each year in case a hurricane occurs.

In response to the warm season lasting longer, a tourism provider said that a nearby boat charter service is offering more tours in the winter to take advantage of these changing conditions. Other behavioral adaptation strategies involve educational events and tools to inform the public about hurricane preparedness, such as a website by the Baldwin County Emergency Management (<https://baldwincountyal.gov/departments/emergency-management-agency>).

Institutional Adaptation Strategies. At the institutional level, a program known as Strengthen Alabama Homes offers grants of up to \$10,000 to help residents of Baldwin and Mobile Counties purchase a Fortified roof through IBHS. Several providers had taken advantage of the program personally, while others were aware of the program. A tourism provider mentioned the program lasted several months due to various requirements, such as getting roof quotes from multiple companies. They stated: *“But like, I mean, it's still, I saved a lot of money by going through them. That was awesome. I appreciate it. My roof cost like right at \$20,000 and they pay \$10,000 of it.”*

Additional paid assistance were available to residents for the implementation of adaptation strategies. Several tourism providers mentioned that the Federal Emergency Management Agency (FEMA) offers grants or insurance subsidies to help people elevate their home *“so FEMA doesn't have to keep paying for it to be fixed .”* A tourism provider said that grants are sometimes available to help with the installation of living shorelines.

Another commonly mentioned institutional adaptation strategy is the updating of building codes by the municipalities on the Alabama coast. A tourism provider said:

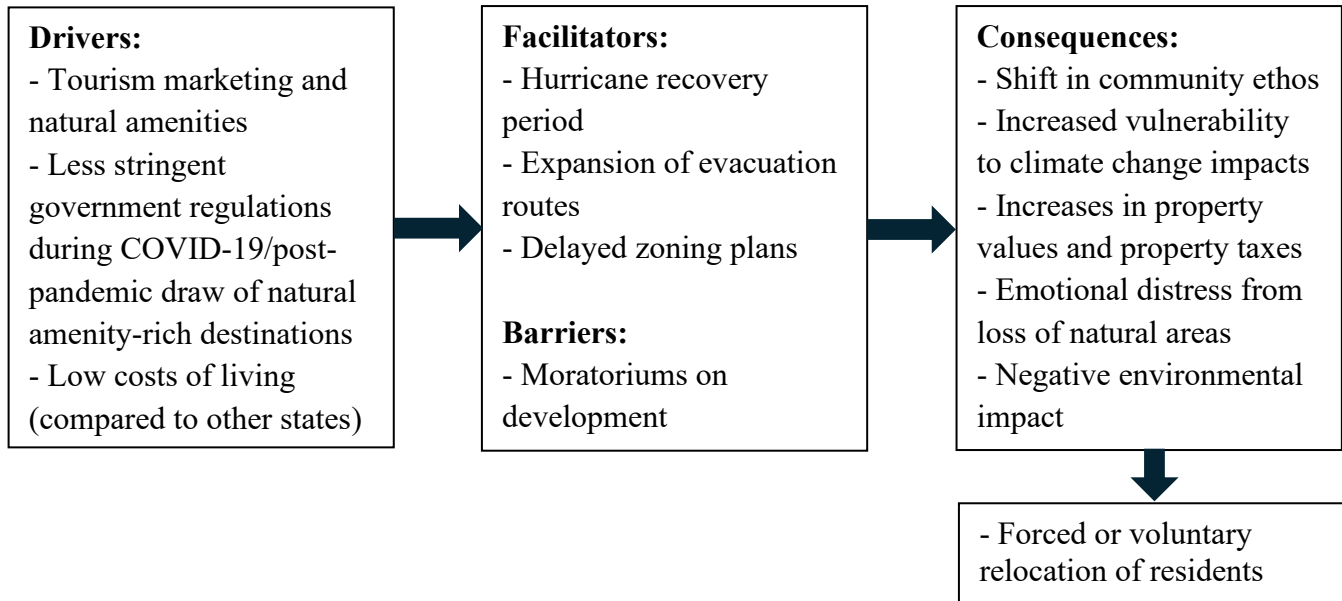
We have some of the strongest building codes in the country. We're hand in hand with Florida, making sure that we can withstand 200 mile per hour winds [...] and as new construction happens, we aren't going to see the devastation as bad.

In-Migration and Human Development

Although I did not specifically inquire about participants' perspectives about the in-migration and residential development occurring in Baldwin County, this topic was frequently mentioned unprompted, demonstrating its saliency among community members. Several tourism providers spoke about how quickly Baldwin County is growing in population, with a tourism provider residing in the county saying: *"So now all of those farms and hay fields are now becoming subdivisions. I think it's, we may be one of the top 10 [areas] in the nation as far as growth this year."* A tourism provider mentioned that newcomers *"move here with money,"* while another said, *"big money buys big properties."* Several tourism providers described new residents in the area as coming from the West Coast, specifically California, while other providers described them as coming from the North and the Midwest. Tourism providers expounded on the elements that drive, facilitate, and bar development within Baldwin County as well as the consequences of development and demographic change for locals and the environment (see Figure 2.1).

Figure 2.1

Tourism Provider Perceptions of In-Migration and Residential Development



Note. Higher and lower-level coding of in-migration and residential development and the relationships between higher-level themes.

Drivers of In-migration. According to participants, primary pull factors drawing people to move to the Alabama coast are the same as those that attract visitors: successful tourism marketing and natural amenities. As said by a tourism provider: *“People want to live at the beach. You know, we’ve done a great job with marketing Gulf Shores and Orange Beach.”* According to a tourism provider, another way that interest in the destination spreads is through news coverage following major hurricanes. Tourism providers explained that newcomers often previously visited the area as tourists: *“A lot of people that I’ve talked to that have either retired here or they’ve moved here because they came here on vacation, saw what a great place it is, and moved here.”*

Several tourism providers mentioned that the comparatively lower cost of property on the Alabama coast compared to other coastal areas is a pull factor; for example: *“If you're in California, or any of these high rent districts, and you're like, I can buy this for a million dollars here, or I can buy that in Alabama for a million. Yeah, I think I'll go there.”*

A couple of providers described the cause of the recent boom in in-migration rates as related to the COVID-19 pandemic. A tourism provider expressed that, during the pandemic, people from *“places that tend to be more democratic in their government style, that were taking lockdown restrictions very seriously”* moved to the Alabama coast partially to take advantage of the more relaxed restrictions. Another tourism provider briefly brought up that, post-pandemic, interest in the Alabama coast has grown because of the opportunity to participate in outdoor recreation activities.

Facilitators and Barriers. A commonly mentioned topic among tourism providers was how the destruction and recovery period following hurricanes facilitates development and in-migration. A couple providers emphasized that, following a hurricane, insurance rates go up and residents face a decision *“whether they're going to spend \$12,000 a year to hold on to a lot that they've had as a family house or something, or if you just go ahead and sell to a developer.”*

A different tourism provider spoke about how, enabled by hurricanes, the town they live in had grown considerably over time:

And I mean every hurricane stuff gets torn out, and [...] these builders come in, tear down that fishing shack and build up a two or three story on stilts. That's the Miami gold standard that can't be torn down by hurricanes. And just as that went on, every single major hurricane we've had, that's happened, and it's gotten bigger and bigger ever since.

A tourism provider described how an adaptation strategy to hurricanes, “*widening highways and adding bridges so we have more evacuation routes,*” has facilitated the movement of greater volumes of people both in and out of the city. One tourism provider explained that there are “*housing developments in the middle of a cornfield*” in Baldwin County because of delayed zoning plans.

According to a tourism provider, the key barriers to rapid development are moratoriums that some municipalities have recently placed on certain types of development. However, the provider questioned the effectiveness of these moratoriums at preventing over-development:

How well that's being enforced? I don't know. And the municipalities that are implementing that are few and far between, so I think it needs to be like a sweeping like county wide requirement, or like retrofit infrastructure, like re-green spaces.

Consequences for Locals and the Environment. A tourism provider in Baldwin County described how, from their perspective, an influx of wealthy newcomers to the area is contributing to an increase in property taxes and insurance rates for long-term residents. They said:

[The newcomers] paid, you know, 100 to 200,000 more than what the property they were buying was worth, just to get the people to sell it. And they did that to the whole area, which raised the property value, which raised the taxes and most of all, tripled the insurance rates.

Although no other provider drew a direct cause and effect relationship between new residents moving in and an increase in the cost of living, other providers commonly brought up rising property values, property taxes, and insurance rates, emphasizing the financial burden that rising costs put on some long-term residents, including those who work as tourism personnel.

Another frequently mentioned consequence of rapid in-migration is a change in community ethos. Some tourism providers had noticed that tourists are beginning to expect a commercialized experience, rather than a personal one. They also described how community relationships have shifted, becoming characterized by transactional relationships, rather than close, personal ones. A tourism provider (Baldwin County) put it this way:

A lot of these people move here, and instead of wanting to join our community in the way our view on life where you enjoy nature, it's about keeping the area clean and sharing with everybody and helping each other up, they move here with money. They buy the land and they put up a fence. You know, this is mine. I paid for it.

A tourism provider said that “*in the past 10 years has been such a drastic change of, I mean, very few people that live here are actually from here,*” and that, from their experience working with newcomers, “*there's just a huge sense of entitlement.*”

A consequence of human development described by several tourism providers is an increase in the community’s vulnerability to climate change impacts. A tourism provider illustrated this perspective as follows: “*The more Dauphin Island gets built on, the less protection as an island we have [from storms].*” Secondly, several tourism providers described how they have noticed that flooding is becoming more severe, attributing this change to an increase in the amount of impervious surfaces due to increased development.

Other tourism providers described the negative impact human development has on the natural environment. A couple of providers spoke about how habitat destruction could affect the stopover of migrating birds. For example, a tourism provider in Baldwin County said: “*Wildland is disappearing for housing developments, and that's a challenge, especially knowing that, you know, we're the one of the first stops on the flight path for the birds coming back from Mexico*

and South America.” A tourism provider in Baldwin County mentioned that, if less birds stop on the Alabama coast due to habitat loss, this could harm tourism as fewer birdwatchers will be drawn to the area. The same provider explained that nesting shorebirds are declining due to the compounding threats of human development and climate change: “And so you have, like, your coastal development that is getting rid of habitat. You have, like increase in sea level rise, which is impacting like where their forage and their prey may be found.”

A consequence of human development expressed by a singular participant was the emotional distress that comes from the loss of natural areas. After describing how an area of woods was cleared for housing development, the provider exclaimed, “*Oh my god that hurts my heart.*”

A couple of tourism providers said that, because of one or more of the consequences of human development described above, they or other long-term residents have chosen to or been forced to relocate. A tourism provider described this as:

And a lot of people who didn't want to sell, even with those outrageous offers, ended up being forced to sell because they had lived here their whole lives. They got their houses from their family members, and they couldn't afford to live here anymore by working at the grocery store like they've been doing most of their life.

Discussion

The purpose of this study was to understand the perception of tourism providers about adaptation strategies to weather and environmental impacts, specifically those related to climate change. The goals of this study were two-fold: (1) to identify what adaptation strategies tourism providers are using to alleviate weather and environmental impacts and (2) to understand how tourism providers perceive human development and in-migration in Baldwin County.

Implementation of Adaptation Strategies

Although some tourism providers were not implementing adaptation strategies to weather and environmental impacts, most tourism providers were involved in the implementation of a variety of adaptation strategies. Many of the adaptation strategies mentioned by participants, especially large-scale strategies, have been discussed in the literature, while other ad-hoc strategies are also worth acknowledging as context-specific solutions (Castro, 2024). Similar to what has been documented on the North Carolina coast (Castro, 2024), tourism providers in our study are adjusting as necessary to protect their operations. Structurally, some businesses have designed buildings to provide a natural cooling effect, such as through including a breezeway. Behaviorally, tourism providers are taking steps to protect themselves and their livelihoods, such as choosing to live in less risk-prone areas, taking necessary precautions and warning tourists during extreme heat, and having a back-up source of income or setting money aside each year in case of a natural disaster.

Coastal real estate on the Alabama coast is highly desired, leading structural adaptation to be dominant mode of adaptation in the region. Specifically, Alabama has over 50,000 houses, mostly located in Baldwin and Mobile Counties, that have been structurally adapted under IBHS's Fortified program, which is greater than any other state (Bowen, 2024). Consistent with these statistics, many participants in our study had personally participated in the program or were at least familiar with it. Several participants described their experience with Fortified houses and commercial buildings faring better than those without the mitigation strategy in the aftermath of Hurricane Sally, which has been empirically supported by a recent study conducted by the Alabama Department of Insurance and the Center for Risk and Insurance Research at the University of Alabama (2025). Fortified houses sustained less damage following the storm than

houses without the building standard. Participating in the Fortified Home program offers a discount from the wind portion of homeowner's insurance and was found to increase property values by 7% at median distances from the Alabama coast, which is greater than the initial investment of between 2% and 4% of the home's value (Awondo et al., 2023).

However, a tourism provider within our study felt as though adaptation efforts within the community should be focused on limiting rapid development in a flood plain, rather than building more houses capable of withstanding the impacts of hurricanes. Structural adaptation measures fail to resolve the paradox of rapid development in coastal areas that are highly vulnerable to the impacts of climate change through hurricanes of increasing intensity and sea level rise (Gould & Lewis, 2021). In other words, structural adaptation allows for continued development in flood prone areas, which increases a community's vulnerability to climate change (Brody et al., 2012).

Financial considerations were a primary concern for private structural adaptation strategies because it is unlikely everyone in the community will be able to afford the strategy, meaning "resilience" can become equated with wealth (Gould & Lewis, 2021). Some participants described how the rebuilding following hurricanes or the structural adaptation of houses was socioeconomically unequal, while another mentioned the financial burden that was placed on them by updated building codes. Other studies on tourism providers have frequently identified financial feasibility as a barrier to climate change adaptation (Matasci et al., 2014; Torabi et al., 2024).

Beach nourishment was similarly described as having benefits and drawbacks that align with those mentioned in the literature. Participants described how the sand must be sourced from specific locations, and how the process of beach nourishment is highly costly. While some

communities may be unable to afford the strategy (Scott et al., 2012), participants mentioned that part of the funding for the projects comes from the Restore Act, which manages the allocation of penalties from the Deepwater Horizon oil spill. Beach nourishment was described as having multiple purposes, such as providing more space for tourists to recreate (Atzori et al., 2018) and for sea turtles to nest and offering increased hurricane protection for buildings behind the beach (Griffith et al., 2015).

Other nature-based solutions, such as a shoreline restoration project, dune restoration, and wetland restoration, were also described as serving multiple purposes. While some tourism providers indicated that these projects would help with the impacts of climate change, climate change itself did not appear to be the primary purpose of adaptation strategies. Similarly, many ski resort operators are using snowmaking to combat decreases in the quality and quantity of snow without necessarily attributing less favorable snow conditions to climate change (Steiger et al., 2017). Hurricanes have always been a part of living on the coast, regardless of the increasing intensity of hurricanes driven by climate change. By preparing for these inevitable natural disasters, tourism operations can protect their livelihoods by reducing their financial losses after the disaster.

The implementation of adaptation strategies reactively in response to incremental changes in the weather and environment, as opposed to proactively in preparation for climate change, has benefits. Lim (2022) found that climate change perception was not a significant predictor of likelihood to adopt adaptation strategies to wildfires and hurricanes. I infer from my study that some individuals may implement adaptation strategies without connecting the measures to natural disasters or climate change. If this is the case, people may not be deterred from adapting due to believing climate change is a distant threat or not occurring at the extent

predicted. While incremental strategies leave tourism providers unprepared for the long-term impacts of climate change, they are temporarily necessary in communities where fundamental strategies, such as retreat, are perceived as unacceptable (Magnan et al., 2020).

In-Migration and Human Development

Participants described how newcomers are wealthy and attracted to the county by its warm climate and proximity to the ocean, aligning closely with the concept of amenity migration. Amenity migration is defined as “the movement of largely affluent urban or suburban populations to rural areas for specific lifestyle amenities, such as natural scenery, proximity to outdoor recreation, cultural richness, or a sense of rurality” (Abrams et al., 2012). Despite Baldwin County being composed of small cities and largely not being rural, I argue that the concept is applicable due to the predominant appeal of the region to newcomers being its natural amenities, according to participants. In parallel with a finding by Thompson et al. (2016), the comparatively lower coastal property costs on the Alabama coast were also seen by participants as a pull factor.

Some tourism providers mentioned that the destruction from hurricanes drives the “upgrading” of properties and the expansion of the built environment beyond its state before the hurricane’s landfall because developers are given the opportunity to acquire land, qualitatively capturing previous findings. Pais and Elliot (2008) found that, after Hurricane Opal which affected the Alabama and the Florida panhandle in 1995, elite entrenchment occurred in the hardest hit areas and population size and in-migration rates significantly increased in the recovery period. While post-hurricane recovery often exacerbates social inequalities, the sentiment of “building back better” following a hurricane is also beneficial (Stoler et al., 2025). Several participants in our study reflected with hope on how the community had responded to the

devastation caused by a hurricane by rebuilding in a way that made them more prepared for future storms.

While human responses to the destruction caused by hurricanes enable human development, unsustainable growth makes coastal communities more vulnerable to the impacts of climate change, as expounded on by several participants, creating a positive feedback loop. Expansion of the built environment leads to an increase in impervious surfaces, worsening the severity and frequency of flooding, especially if the development is sprawling and less concentrated (Brody et al., 2012). In addition, as natural areas that buffer the effects of storms, such as wetlands and forests, are converted to human land uses, the community has less protection from these weather events (Brody et al., 2007). Thus, the most vulnerable residents who cannot afford to elevate or strengthen their homes are at heightened risk from the impacts of climate change because of a problem that they did not create (Gould & Lewis, 2021).

Human development also threatens the health of the natural environment and people's economic dependence on and social attachments to these areas. The Alabama coast is an important stopover and resting area for migrating birds before or after crossing the Gulf of Mexico, meaning habitat loss in these areas will have negative impacts on bird populations (Ward et al., 2018) and, consequently, on birding as a tourism activity. Another consequence of human development that was mentioned during interviews was the emotional distress caused by the loss of natural areas for residential development, a feeling that could be equated to "ecological grief" (Cunsolo & Ellis, 2018).

Many participants described how property values, property taxes, and insurance rates are increasing and making it more difficult for long-term residents to afford to remain, a process related to gentrification. Although there are a multitude of definitions and methods for

identifying gentrification, the term generally refers to an influx of affluent newcomers, an increase in property values, and the forced or voluntary relocation of lower-income locals (Barton, 2014). Several participants mentioned that insurance rates have increased and companies have withdrawn from high-risk areas after major storm events, which can serve as a mechanism for hazard gentrification, in which responses to climate change impacts lead to the displacement of those of a lower socioeconomic status (Stoler et al., 2025).

In addition to a decrease in housing affordability as property taxes and rents increase, gentrification can also cause sociocultural displacement, in which people no longer feel welcome as the character of the community shifts around them (Hernandez et al., 2025). Several long-term residents were disheartened with how the ethos of their community and the tourism industry have changed as newcomers have moved in, with participants' sentiments mirroring the transition between Ferdinand Tönnies' sociological concepts of *Gemeinschaft* (represents traditional, rural life with intimate, personal bonds) and *Gesellschaft* (represents modern, urban life with impersonal, contractual relationships) (Waters, 2016). Once close-knit fishing towns with close personal relationships and a common sense of identity (*Gemeinschaft* values), participants described that the region has grown into bustling tourist destinations with hot real estate markets and transactional relationships that more closely emulate *Gesellschaft*.

Limitations

Based on the reflexive thematic approach used, I chose to expand the study design during data analysis to include a question on human development and in-migration, topics that were frequently brought up unprompted by participants, revealing their salience among community members. However, I acknowledge that participants who brought up the topics may have done so because they hold particularly strong opinions about them. Additionally, if prompted, other

participants may have had similar or differing viewpoints on these topics. Due to the qualitative nature of this study, the results represent the subjective experiences of participants and are mainly applicable to the Alabama coast, although limited transferability may be possible to other coastal tourist destinations.

Conclusion

Although few adaptation strategies were implemented in anticipation of the impacts of climate change, many participants on the Alabama coast were implementing strategies to protect the community or their personal livelihoods from weather and environmental impacts, such as hurricanes, flooding, extreme heat, and shoreline erosion. Fortified building certifications have been widely adopted by residents and some commercial businesses and have been shown to be effective, anecdotally and empirically, at mitigating wind damage to houses and buildings. Still, structural adaptation such as Fortified houses are not a panacea for coastal resilience. As a private adaptation strategy, socioeconomic status may bar lower-income residents from implementing the strategy. Public adaptation strategies, such as beach nourishment and habitat restoration projects, should be continued and expanded as they lessen the impacts of climate change for all residents and improve the appeal of the destination for tourists.

While structural adaptation is a valuable adaptation strategy, limiting development and planning for sustainable growth in Baldwin County is simultaneously important as demonstrated by the social and environmental consequences of rapid development described by tourism providers. More intense hurricanes driven by climate change and unplanned human development can create a positive feedback loop that ultimately increases the climate change risk for community members, especially for lower-income residents. If in-migration continues at its current rate, it may lead to the displacement of long-time locals, including those providing

tourism services, due to decreasing housing affordability and shifting community ethos.

Government zoning regulations and the protection of natural areas, such as through conservation easements, can serve as valuable tools for buffering residential sprawl from and concentrating development within the cities in Baldwin County (Beatley, 2009; Brody et al., 2008). Policy makers should consider that protecting existing natural areas is more cost effective and efficient at lessening the effects of climate change compared to habitat restoration (Brody et al., 2008).

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Appendix 1: Semi-Structured Interview Guide

Data Collection Instrument Semi-structured Interview Guide

Introduction and Verbal Informed Consent

- Welcome the participant and thank them for agreeing to the interview.
- Briefly (re)introduce yourself and the purpose of the study.
- Explain the format and duration of the interview.

Before we begin, I want to ensure that you are fully informed about the study and your participation. The purpose of this study is to understand how tourism providers on the Alabama Gulf Coast perceive weather and environmental changes and their views on potential adaptation strategies.

Your participation in this interview is completely voluntary. You can choose to skip any questions or stop the interview at any time. You should have received an informed consent document before this interview, do you have any questions about that?

With your permission, I would like to audio record this interview to ensure that I capture your responses accurately. The recording will be kept confidential and stored securely. Do you consent to participate in this interview and have it audio recorded?

If agreed, start recording and restate, for the record, their consent to participate and be recorded.

Time when consent was given: _____

Interview Guide

1. Participants' Experience History Related to Tourism in the Region

Can you tell me about your background and experience in the tourism industry here on the Alabama Gulf Coast?

Prompts:

- How long have you been working in this region, and in what capacity?
- What initially drew you to work in the tourism industry in this region?
- Can you give me an idea of what a typical workday looks like for you?

- How would you describe your connection to the natural environment here on the Alabama Gulf Coast?
- What is typically the busiest time of year for your business or organization?
- Can you describe the types of tourism activities that your business or organization offers?
- Can you describe the types of tourists (i.e., student groups, families, people of all ages) you typically interact with?
- Have you noticed any changes in the types of tourists or their preferences over time?

2. Experiences with Weather and Environmental Changes

Have you noticed any weather or environmental changes in this region over the years? If so, can you describe them?

Prompts:

- How have these changes impacted your business or the tourism industry here?
- Can you share specific examples of how weather or environmental changes have affected tourist activities or preferences?
- Have you observed any changes in visitation patterns that you believe are related to weather or climate?
- Have you received feedback from tourists regarding weather or environmental changes? If so, what have they said?
- Are there any particular seasons or times of year when these impacts are more noticeable?
- What specific weather events have stood out for you the most since working in this region? Can you describe what happened and how you experienced it?
- What specific weather events have had the most significant impact on tourism in your experience?

3. Experience with Adaptation to Weather and Environmental Impacts

Have you or your organization taken any steps to adapt to weather or environmental impacts? If so, what have you done?

Prompt:

- Have you changed how you run your business or organization in response to weather or environmental changes? If so, what have you done?
- What strategies or measures have been most effective in your experience?
- Have other people that you know working in the tourism industry taken steps to adapt to weather or environmental changes? If so, what have they done?

Can you describe any challenges you faced while implementing these adaptation measures?

Prompts:

- Have you collaborated with other businesses or organizations to address extreme weather or environmental changes? If so, how?
- Are there any specific resources or support systems that have helped you adjust to these changes?

4. Perceived Barriers to Adapting to Weather and Environmental Impacts

What challenges or barriers have you encountered when trying to adapt to environmental changes?

Prompts:

- Are there any specific factors that make it difficult for you or others in the tourism industry to implement adaptation strategies?
- How do financial constraints impact your ability to adapt to weather and environmental changes?
- Do you feel there is sufficient information and guidance available to help you adapt to weather and environmental changes? Why or why not?
- What role do you think government policies or regulations play in facilitating or hindering adaptation efforts?

5. Belief and Knowledge about Climate Change

Before I ask these last questions, I want to let you know that there are no right or wrong answers, and I am not supporting any viewpoint. My goal here is to better understand your perspective. Today, we have been talking about weather and environmental changes that you have noticed from your firsthand experiences. Do you think any of these changes are related to broader ideas that the climate is changing? Why or why not?

Prompts:

- What comes to mind when you think of climate change?
- In your own words, how would you describe the factors (i.e., human, natural) that contribute to climate change?

How well-informed do you feel about climate change?

Prompts:

- How well-informed do you feel about the impacts of climate change here on the Alabama Coast?

- From what sources (i.e., friends, family, news) do you get your information about issues like climate change?

Are you concerned about climate change? Why or why not?

Prompts:

- How does the idea of the changing climate come up in your work in the tourism sector? Is it something that matters to people around here, or not so much?
- Are you concerned about the future impacts of climate change on the tourism industry here? Why or why not?

Closing

Thank you for sharing your insights and experiences with me today. Your input is incredibly valuable to our research. Do you have any additional comments or thoughts on this topic that we haven't covered?

If you have any questions or think of anything else after this interview, please feel free to contact me at allie.mccreary@auburn.edu or 1-334-844-1059 [*and/or student's contact information*].

Thank you again for your time and participation.



AUBURN UNIVERSITY

College of Forestry, Wildlife and Environment

Appendix 2: Information Letter

INFORMATION LETTER

Title of research study: *Understanding Resiliency for Nature-Based Coastal Tourism*

Investigator: *Allie McCreary*

Sponsor: *Auburn University Creative Work and Social Impact Scholarship Funding Program*

You are invited to participate in a research study to understand how tourism providers in the Alabama Gulf Coast perceive weather and environmental changes and their views on potential adaptation strategies. The study is being conducted by Allie McCreary, Assistant Professor in the Auburn University Department of Parks & Recreation Management. You were selected as a possible participant because you were identified as a current professional working in the tourism sector along the Alabama Gulf Coast.

What will be involved if you participate? If you take part in this research, you will be responsible to participate in a sixty-minute guided interview.

Are there any risks or discomforts? The risks associated with participating in this study are minimal.

Are there any benefits to yourself or others? If you participate in this study, you can expect to receive minimal benefit. You may gain a better understanding of the potential impacts of weather and environmental changes on your industry, which can inform your future planning and decision-making processes. You will benefit the scientific community by contributing to valuable research that aims to identify effective adaptation strategies for the tourism sector.

Will you receive compensation for participating? To thank you for your time you will be offered a \$50 gift card.

Are there any costs? There are no costs associated with the study, but the interview will take one hour of your time.

If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University of the College of Forestry, Wildlife and Environment.

Any data obtained in connection with this study will remain anonymous. Strict protocols will be implemented to protect participants' identities and the confidentiality of their responses. These measures include de-identifying data, securely storing information, and limiting access to the research team. Information collected through your participation may be used to fulfill an educational requirement (master's thesis), published in a professional journal, and/or presented at a professional meeting.

If you have questions about this study, please ask them now or contact Allie McCreary at allie.mccreary@auburn.edu or 1-334-844-1059.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334) 844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu